

IN THE TITLE

Please delete the title in its entirety and insert – APPARATUS FOR ELECTRON BEAM-INDUCED CHEMICAL ETCHING – therein.

IN THE CLAIMS

Please amend claims 1, 5, 7, 9-12, and 18-24.

Please add new claims 25-33.

Please enter the pending claims as follows:

1. (Currently Amended) An apparatus comprising:
 - a holder ~~adapted~~ to mount a substrate;
 - a stage ~~adapted~~ to position said holder in a chamber;
 - ~~a pumping system adapted to evacuate said chamber;~~
 - an imaging system ~~adapted~~ to locate an opaque defect on ~~in~~ said substrate, said imaging system comprising a first electron column, said first electron column to direct a first set of electrons towards said opaque defect;
 - a gas delivery system ~~adapted~~ to dispense a reactant gas towards said opaque defect; and
 - an electron delivery system ~~adapted to direct electrons towards said opaque defect and~~ induce chemical etching of said opaque defect by said reactant

gas, said electron delivery system comprising a second electron column, said second electron column to direct a second set of electrons towards said opaque defect.

2-3. (Canceled)

4. (Original) The apparatus of claim 1 wherein said substrate comprises a transmissive DUV mask.

5. (Currently Amended) The apparatus of claim 4 ~~[[1]]~~ wherein said opaque defect comprises chrome and said reactant gas comprises chlorine and oxygen.

6. (Original) The apparatus of claim 1 wherein said substrate comprises a reflective EUV mask.

7. (Currently Amended) The apparatus of claim 6 ~~[[1]]~~ wherein said opaque defect comprises an absorber and said reactant gas comprises Xenon Fluoride (XeF_2).

8. (Original) The apparatus of claim 1 wherein said opaque defect comprises Carbon and said reactant gas comprises water vapor or oxygen.

9. (Currently Amended) The apparatus of claim 1 further comprising a focusing system ~~adapted~~ to highly focus said second set of electrons on said opaque defect.

10. (Currently Amended) The apparatus of claim 1 further comprising a scanning system ~~adapted~~ to scan said second set of electrons across said opaque defect.

11. (Currently Amended) The apparatus of claim 1 further comprising an acceleration system ~~adapted~~ to provide a low acceleration voltage for said second set of electrons.

12. (Currently Amended) The apparatus of claim 1 further comprising a computer ~~adapted~~ to control said electron delivery system.

13-17. (Canceled)

18. (Currently Amended) The apparatus of claim 1 wherein said gas delivery system is further ~~also adapted~~ to dispense a carrier gas towards said opaque defect.

19. (Currently Amended) The apparatus of claim 1 wherein said gas delivery system is to dispense ~~dispenses~~ said reactant gas with an angular dispersion of 5-25 degrees.

20. (Currently Amended) The apparatus of claim 1 wherein said reactant gas is to adsorb ~~adsorbs~~ to said opaque defect and is to become ~~becomes~~ disassociated.

21. (Previously Presented) The apparatus of claim 1 wherein said chamber comprises a pressure of about 0.500-10.000 milliTorr (mT) locally over said opaque defect.

22. (Currently Amended) The apparatus of claim 1 wherein said second set of electrons is to form a beam comprising a current of about 0.050-1.000 nanoAmperes (nA).

23. (Currently Amended) The apparatus of claim 1 wherein said second set of electrons is to form a beam comprising a tail diameter of about 5-125 nm.

24. (Currently Amended) The apparatus of claim 1 wherein said second set of electrons is to comprise a range of 0.3-3.0 keV.

25. (New) An apparatus comprising:

a chamber;

a stage disposed in said chamber, said stage to move in different directions;

a holder positioned in said chamber by said stage;

a mask mounted on said holder;

an opaque defect disposed on said mask;

an imaging system for said chamber, said imaging system to locate said opaque defect;

a gas delivery system for said chamber;

a gas dispensed by said gas delivery system towards said opaque defect;

an electron delivery system for said chamber;

electrons directed by said electron delivery system towards said opaque defect, said electrons to induce said gas to etch said opaque defect without ion bombardment; and

a pumping system to evacuate volatile byproducts of said etch.

26. (New) The apparatus of claim 25 wherein said electrons comprise a range of 0.3-3.0 keV.

27. (New) The apparatus of claim 25 wherein said electron delivery system further comprises focusing controls.

28. (New) The apparatus of claim 25 wherein said electron delivery system further comprises scanning controls.

29. (New) The apparatus of claim 25 wherein said gas comprises water or oxygen.

30. (New) The apparatus of claim 25 wherein said gas comprises Xenon Fluoride (XeF_2).

31. (New) An apparatus comprising:

a chamber, said chamber to hold a mask;

an imaging system for said chamber, said imaging system to locate an opaque defect on the mask;

a gas delivery system for said chamber, said gas delivery system to dispense one or more gases towards said opaque defect ; and

an electron delivery system for said chamber, said electron delivery system to direct electrons towards said opaque defect, said electrons to induce chemical etching of said opaque defect by said one or more gases without ion implantation or knock-on of atoms.

32. (New) the apparatus of claim 31 wherein said electrons comprise an acceleration voltage of about 1.0 keV or less.

33. (New) The apparatus of claim 31 wherein said chemical etching is reaction-limited and not mass transfer-limited.